SBIR

Small Business Innovation Research

FY 2003

NOAA PROGRAM SOLICITATION

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U.S. DEPARTMENT OF COMMERCE

http://www.oar.noaa.gov/ORTA/SBIR

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U.S. DEPARTMENT OF COMMERCE
NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION

PROGRAM SOLICITATION FOR SMALL BUSINESS INNOVATION RESEARCH

1.0 PROGRAM DESCRIPTION

1.1 Introduction

The Department of Commerce (DOC) National Oceanic and Atmospheric Administration (NOAA) invites small businesses to submit research proposals under this solicitation. Firms with strong research capabilities in any of the areas listed in Section 8 of this solicitation are encouraged to participate. **Unsolicited proposals are not accepted under the Small Business Innovation Research (SBIR) program**.

Objectives of this program include stimulating technological innovation in the private sector and strengthening the role of small business in meeting Federal research and development (R&D) needs. This program also seeks to increase the commercial application of innovations derived from Federal research and to foster and encourage participation by socially and economically disadvantaged and woman-owned small businesses.

1.2 Three-Phase Program

The "Small Business Innovation Research Program Reauthorization Act of 2000" requires the Department of Commerce to establish a three-phase SBIR program by reserving a percentage of its extramural R&D budget to be awarded to small business concerns for innovation research.

The funding vehicles for NOAA's SBIR program in both Phase 1 and Phase 2 are contracts. This document solicits Phase 1 proposals only.

NOAA has the unilateral right to select SBIR research topics and awardees in both Phase 1 and Phase 2, and to award several or no contracts under a given subtopic.

1.2.1 Phase 1 - Feasibility Research

The purpose of Phase 1 is to determine the technical feasibility of the proposed research and the quality of performance of the small business concern receiving an award. Therefore, the proposal should concentrate on research that will significantly contribute to proving the feasibility of the proposed research, a prerequisite to further support in Phase 2.

1.2.2 Phase 2 - Research and Development

Only firms that are awarded Phase 1 contracts under this solicitation will be given the opportunity of submitting a Phase 2 proposal immediately following completion of Phase 1. Phase 2 is the R&D or prototype development phase. It will require a comprehensive proposal outlining the research in detail and a plan to commercialize the final product. Each Phase 2 applicant will be required to provide information for the SBA Tech-Net Database System (http://technet.sba.gov), when advised this system can accept their input.

Further information regarding Phase 2 proposal and Tech-Net requirements will be provided to all firms receiving Phase 1 contracts

1.2.3 Phase 3 - Commercialization

In Phase 3, it is intended that non-SBIR capital be used by the small business to pursue commercial applications of Phase 2.

1.3 Eligibility

Each organization submitting a proposal **must** qualify as a small business (Section 2.1) for research or R&D purposes (Section 2.2) at the time of the award. In addition, the primary employment of the principal investigator must be with the small business at the time of the award and during the conduct of the research. More than one-half of the principal investigator's time must be spent with the small business for the period covered by the award. **Primary employment with a small business precludes full-time employment with another organization. Deviation from these requirements must be approved by the program manager in consultation with the contracting officer.**

Also, for both Phase 1 and Phase 2, the work must be performed in the United States. "United States" means the fifty states, the territories and possessions of the United States, the Commonwealth of Puerto Rico, the District of Columbia, the Republic of the Marshall Islands, the Federated States of Micronesia, and the Republic of Palau. **The program manager in consultation with the contracting officer may approve exceptions to this requirement.**

Joint ventures and limited partnerships are eligible, provided the entity created qualifies as a small business as defined in this solicitation. **Consultative arrangements between firms and universities or other non-profit organizations are encouraged, with the small business serving as the prime contractor.**

1.4 Contact with NOAA

In the interest of competitive fairness, oral or written communication with NOAA or any of its components concerning additional information on the technical topics described in Section 8 of this solicitation **is prohibited**.

Requests for general information on the NOAA SBIR program may be addressed to:

Dr. Joseph M. Bishop, NOAA SBIR Program Manager
1335 East-West Highway, Silver Spring, MD 20910-3284
Telephone: (301) 713-3565, Fax: (301) 713-4100,
E-mail: joseph.bishop@noaa.gov

Information sources are listed in Section 7

2.0 DEFINITIONS

2.1 Small Business Concern

A small business concern is one that, at the time of award for Phase 1 and Phase 2:

(a) is independently owned and operated, is organized for profit, is not dominant in the field of operation in which it is proposing, and has its principal place of business located in the United States (Section 1.3);

(b) is at least 51 percent owned, or in the case of a publicly owned business, at least 51 percent of its voting stock is owned by United States citizens or lawfully admitted permanent resident aliens; and

(c) has, including its affiliates, a number of employees not exceeding 500, and meets the other small business regulatory requirements found in 13 Code of Federal Regulations Part 121. Business concerns are affiliates of one another when, either directly or indirectly, (1) one concern controls or has the power to control the other, or (2) a third party controls both. Control can be exercised through common ownership, common management, and contractual relationships. Business concerns include, but are not limited to, any individual, partnership, joint venture, association, or cooperative.

2.2 Research or Research and Development

Any activity that is (a) a systematic, intensive study directed toward greater knowledge or understanding of the subject studied; (b) a systematic study directed specifically toward applying new knowledge to meet a recognized need; or (c) a systematic application of knowledge toward the production of useful materials, devices, systems, or methods, and includes design, development, and improvement of prototypes and new processes to meet specific requirements.

In general, the NOAA SBIR program will fund Phase 1 and 2 proposals with objectives that can be defined by (b) and (c) above.

2.3 Socially and Economically Disadvantaged Small Business Concern

Is one that is:

(a) at least 51 percent owned by (1) an American Indian tribe or a native Hawaiian organization, or (2) one or more socially and economically disadvantaged individuals, and

(b) controlled by one or more such individuals in its management and daily business operations.

A socially and economically disadvantaged individual is defined as a member of any of the following groups: Black Americans, Hispanic Americans, Native Americans, Asian-Pacific Americans, Subcontinent Asian Americans, or any other individual found to be socially and economically disadvantaged by the Small Business Administration (SBA) pursuant to Section 8(a) of the Small Business Act, 15 U.S. Code (U.S.C.) 637(a).

2.4 Women-Owned Small Business

A small business that is at least 51 percent owned by a woman or women who also control (meaning to exercise the power to make policy decisions) and operate (meaning being actively involved in the day-to-day management) the small business.

2.5 Funding Agreement

The funding vehicles for NOAA's SBIR program in Phase 1 and Phase 2 are contracts.

2.6 Subcontract

This is any agreement, other than one involving an employer-employee relationship, entered into by a Federal Government funding awardee, calling for supplies or services required solely for the performance of the original funding agreement.

2.7 Commercialization

This is locating or developing markets and producing and delivering products or services for sale (whether by the originating party or by others). As used here, commercialization includes both Government and private sector markets.

3.0 PROPOSAL PREPARATION INSTRUCTIONS AND REQUIREMENTS

3.1 Proposal Requirements

The objective is to provide sufficient information to demonstrate that the proposed work represents a sound approach to the investigation of an important scientific or engineering innovation worthy of support. **The proposal must meet all the requirements of the subtopic in Section 8 to which it applies**. A proposal must be self-contained and written with all the care and thoroughness of a scientific paper submitted for publication. It should indicate a thorough knowledge of the current status of research in the subtopic area addressed by the proposal. **A proposal will not be deemed acceptable if it represents presently available technology.** Each proposal should be checked carefully by the offeror to ensure inclusion of all essential material needed for a complete evaluation. The proposal will be peer reviewed as a scientific paper. (All units of measurement should be in the metric system).

NOAA reserves the right not to submit to technical review any proposal which it finds to have insufficient scientific and technical information, or one which fails to comply with the administrative procedures as outlined in the NOAA/SBIR Checklist in Section 10.

The proposal must not only be responsive to the specific NOAA program interests described in Section 8 of the solicitation, but also serve as the basis for technological innovation leading to **new commercial products, processes, or services.** An organization may submit different proposals on different subtopics or different proposals on the same subtopic under this solicitation. When the proposed innovation applies to more than one subtopic, the offeror must choose that subtopic which is most relevant to the offeror's technical concept.

Proposals principally for the commercialization of proven concepts or for market research must not be submitted for Phase 1 funding, since such efforts are considered the responsibility of the private sector.

The proposal should be direct, concise, and informative. Promotional and other material not related to the project shall be omitted. **The Phase 1 proposal must provide a description of potential commercial applications.**

3.2 Phase 1 Proposal Limitations

- **!** Page Length - **no more than 25 pages**, consecutively numbered, including the cover page, project summary, main text, references, resumes, any other enclosures or attachments, and the proposal summary budget.
- **!** Paper Size - must be 21.6 cm X 27.9 cm (8 ½" X 11").
- **!** Print Size - **must be easy to read with a fixed pitch font of 12 or fewer characters per inch or proportionally spaced font of point size 10 or larger with no more than 6 lines per inch. Margins should be at least 2.5cm.**

Supplementary material, revisions, substitutions, audio or video tapes, or computer floppy disks will **not** be accepted.

Proposals not meeting these requirements will be returned without review.

3.3 Phase 1 Proposal Format

3.3.1 Cover Sheet

Complete Section 9.1 "Cover Page" as page 1 of each copy of each proposal. **NO OTHER COVER WILL BE ACCEPTED.** Xerox copies are permitted.

3.3.2 Project Summary

Complete Section 9.2 "Project Summary" as page 2 of your proposal. The technical abstract should include a brief description of the problem or opportunity, the innovation, project objectives, and technical approach.

In summarizing anticipated results, include technical implications of the approach (for both Phase 1 and 2) and the potential commercial applications of the research. **The Project Summary of proposals that receive an award will be published by NOAA and, therefore, must not contain proprietary information.**

3.3.3 Technical Content

Beginning on page 3 of the proposal, include the following items with headings as shown:

(a) **Identification and Significance of the Problem or Opportunity.** Make a clear statement of the specific research problem or opportunity addressed, its innovativeness, commercial potential, and why it is important. Show how it applies to a specific subtopic in Section 8.

(b) **Phase 1 Technical Objectives.** State the specific objectives of the Phase 1 effort, including the technical questions it will try to answer to determine the feasibility of the proposed approach.

(c) **Phase 1 Work Plan.** Include a detailed description of the Phase 1 R&D plan. The plan should indicate not only what will be done, but where it will be done, and how the R&D will be carried out. The methods planned to achieve each objective or task should be discussed in detail. **This section should be at least one-third of the proposal.**

(d) **Related Research or R&D.** Describe research or R&D that is directly related to the proposal, including any conducted by the principal investigator or by the proposer's firm. Describe how it relates to the proposed effort, and describe any planned coordination with outside sources. **The purpose of this section is to persuade reviewers of the proposer's awareness of recent development in the specific topic area and assure them that the proposed research represents technology presently not available in the marketplace.**

(e) **Key Personnel and Bibliography of Related Work.** Identify key personnel involved in Phase 1, including their related education,

experience, and publications. Where resumes are extensive, summaries that focus on the most relevant experience and publications are suggested. List all other commitments that key personnel have during the proposed period of contract performance.

(f) **Relationship with Future R&D.** Discuss the significance of the Phase 1 effort in providing a foundation for the Phase 2 R&D effort. Also state the anticipated results of the proposed approach, if Phases 1 and 2 of the project are successful.

(g) **Facilities and Equipment.** The conduct of advanced research may require the use of sophisticated instrumentation or computer facilities. The proposer should provide a detailed description of the availability and location of the facilities and equipment necessary to carry out Phase 1.

(h) **Consultants and Subcontracts.** The purpose of this section is to convince NOAA that: (1) research assistance from outside the firm materially benefits the proposed effort, and (2) arrangements for such assistance are in place at the time the proposal is submitted.

Outside involvement in the project is encouraged where it strengthens the conduct of the research; such involvement is not a requirement of this solicitation.

1. Consultant - A person outside the firm, named in the proposal as contributing to the research, must provide a signed statement confirming his/her availability, role in the project, and agreed consulting rate for participation in the project. *This statement is part of the page count.*

2. Subcontract - Similarly, where a subcontract is involved in the research, the subcontracting institution must furnish a letter signed by an appropriate official describing the programmatic arrangements and confirming its agreed participation in the research, with its proposed budget for this participation. *This letter is part of the page count.*

(i) **Potential Commercial Application and Follow-on Funding Commitment.** Describe in detail the commercial potential of the proposed research, how commercialization would be pursued, benefits over present products on the market, and potential use by the Federal Government.

(j) **Cooperative Research and Development Agreements (CRADA).** State if the applicant is a current CRADA partner with NOAA, or with any other Federal agency, naming the agency, title of the CRADA, and any relationship with the proposed work.

(k) **Guest Researcher.** State if the applicant is a guest researcher at NOAA, naming the sponsoring laboratory.

(l) **Cost Sharing.** Cost participation could serve the mutual interest of NOAA and certain SBIR contractors by helping to assure the efficient use of available resources. Except where required by other statutes, NOAA does not encourage or require cost sharing on Phase 1 projects, nor will cost

sharing be a consideration in evaluation of Phase 1 proposals.

3.4 Equivalent Proposals or Awards

A firm may have received other SBIR awards or elected to submit essentially equivalent proposals under other SBIR program solicitations. In these cases, a statement **must** follow the Technical Content section in the proposal indicating:

(a) the name and address of all agencies to which a proposal was submitted or from which an SBIR award was received;

(b) the date of proposal submission or date of award;

(c) the title, number, and date of the SBIR program solicitation under which a proposal was submitted or award received;

(d) the specific applicable research topic for each proposal submitted or award received;

(e) the title of the research project; and

(f) the name and title of the principal investigator for each proposal submitted or award received.

If no equivalent proposal is under consideration or equivalent award received, a statement to that effect **must** be included in this section.

3.5 Prior SBIR Phase 2 Awards

If a small business concern has received one or more Phase 2 awards from any of the Federal agencies in the prior 5 fiscal years, it must submit on a separate page, the names of awarding agencies, dates of awards, funding agreements numbers, amounts, topics or subtopic titles, follow-on agreements amounts, sources and dates of commitments, and current commercialization status for each Phase 2. This required information shall not be part of the page count limitation.

3.6 Proposed Budget

Complete the "SBIR Proposal Summary Budget" (Section 9.3) for the Phase 1 effort, and include it as the last page of the proposal. Some items of this form may not apply. Enough information should be provided to allow NOAA to understand how the offeror plans to use the requested funds if the contract is awarded. A complete cost breakdown should be provided giving labor rates, proposed number of hours, overhead, G&A, and profit. A reasonable profit will be allowed. When proposing travel, identify the number of trips, people involved, labor categories, destination of travel, duration of trip, commercial air fare or mileage rate, per diem expenses, and purpose of travel. Budgets for travel funds must be justified and related to the needs of the project.

Where equipment is to be purchased, list each individual item with the corresponding cost. The inclusion of equipment will be carefully reviewed relative to need and appropriateness for the research proposed. Equipment is defined as an article of nonexpendable, tangible property having a useful life of more than 1 year and an acquisition cost of $5,000 or more per unit.

SBA Policy requires that NOAA not issue SBIR awards that include provisions for subcontracting any portion of the contract back to the originating agency or any other Federal Government agency or to other units of the Federal Government. Requests for waivers from this requirement must be sent to the NOAA program manager.

For Phase 1, a minimum of two-thirds of the research and/or analytical effort must be performed by the proposing firm. The total cost for all consultant fees, facility leases, usage fees, and other subcontract or purchase agreements may not exceed one-third of the total contract. For Phase 2, one-half of the research and/or analytical effort must be performed by the proposing firm.

4.0 METHOD OF SELECTION AND EVALUATION CRITERIA

4.1 Introduction

All Phase 1 and 2 proposals will be evaluated on a competitive basis. Each Phase 1 proposal will be screened by NOAA to ensure that it meets the administrative requirements outlined in Section 4.2. Proposals that meet these requirements will be peer reviewed, undergo competition within each laboratory, and may also undergo a third round of competition across the agency.

4.2 Phase 1 Screening Criteria

To avoid a misunderstanding, small businesses are cautioned that Phase 1 proposals not satisfying all the screening criteria shall be returned without peer review and eliminated from consideration for a contract. Proposals may not be resubmitted (with or without revision) under this solicitation. All copies of proposals that fail the screening process will be returned. The screening criteria are:

(a) The proposing firm must qualify as a small business (Section 2.1). If it is a subsidiary of another firm, this limit applies to all employees under control of the parent organization.

(b) The Phase 1 proposal must meet **all** of the requirements stated in Section 3.

(c) The Phase 1 proposal must be limited to one subtopic and clearly address research for that subtopic.

(d) **Phase 1 proposal budgets must not exceed $75,000 (except subtopics with the suffix "SG", which are limited to $50,000).**

(e) **The project duration for the Phase 1 research must not exceed 6 months.**

(f) A minimum of two-thirds of expenditures under each Phase 1 project must be carried out by the proposing firm.

(g) The proposal must contain information sufficient to be peer reviewed as research.

4.3 Phase 1 Evaluation and Selection Criteria

Phase 1 proposals will be rated by NOAA and/or external scientists or engineers with equal consideration given to the following criteria, except for item (a), which will receive twice the value of any of the other items:

(a) The scientific and technical merit of the Phase 1 research plan and its relevance to the objectives, with special emphasis on its innovativeness and originality.

(b) Importance of the problem or opportunity and anticipated benefits of the proposed research to NOAA, and the commercial potential, if successful.

(c) How well the research objectives, if achieved, establish the feasibility of the proposed concept and justify a Phase 2 effort.

(d) Qualifications of the principal investigator(s), other key staff, and consultants, and the probable adequacy of available or obtainable instrumentation and facilities.

Technical reviewers will base their ratings on information contained in the proposal. It cannot be assumed that reviewers are acquainted with any experiments referred to, key individuals, or the firm.

Final award decisions will be made by NOAA based upon ratings assigned by reviewers and consideration of additional factors, **including possible duplication of other research,** the importance of the proposed research as it relates to NOAA needs, and the availability of funding. NOAA may elect to fund several or none of the proposals received on a given subtopic. Upon selection of a proposal for a Phase 1 award, NOAA reserves the right to negotiate the amount of the award.

4.4 Phase 2 Evaluation and Selection Criteria

The Phase 2 proposal will undergo NOAA and external peer review for the purpose of determining overall technical or scientific merit. Review panels (one for subtopics identified as "SG", and one for all other subtopics), composed of senior technical specialists, will make the final Phase 2 selection decision based on the written reviews and the company presentation to the panel. Each of the following evaluation criteria will receive approximately equal weight, except for item (a), which will receive twice the value of any of the other items:

(a) The scientific and technical merit with emphasis on innovation and originality.

(b) Degree to which the Phase 1 objectives were met.

(c) The commercial potential of the proposal as evidenced by: a) a record of commercialization, b) the existence of Phase 2 funding commitments from non-SBIR sources, c) existence of Phase 3 follow-on commitments, and d) the presence of other indications of commercial potential of the research.

(d) The adequacy of the Phase 2 objectives to meet the problem or opportunity.

(e) The qualifications of the principal investigator and other key personnel to carry out the proposed work.

Upon selection of a proposal for Phase 2 award, NOAA reserves the right to negotiate the amount of the award. NOAA is not obligated to fund any specific Phase 2 proposal.

4.5 Release of Proposal Review Information

After final award decisions have been announced, the technical evaluations of a proposal will be provided to the proposer only upon written request and for a period not to exceed 90 days. The identity of the reviewers will not be disclosed.

5.0 CONSIDERATIONS

5.1 Awards

Contingent upon availability of funds, NOAA anticipates making about **15** Phase 1 firm-fixed-price contracts of no more than **$75,000** each (except for subtopics with the suffix "SG", which are limited to $50,000). Performance period, with no exception, shall be no more than 6 months beginning on the contract start date. Historically, NOAA has funded about ten percent of the Phase 1 proposals submitted.

Phase 2 awards shall be for no more than $300,000 (except for subtopics with the suffix "SG", which are limited to $200,000). The period of performance in Phase 2 will depend upon the scope of the research, but should not normally exceed 24 months.

It is anticipated that **approximately one-third of the Phase 1 awardees will receive Phase 2 awards,** depending upon the availability of funds. To provide for an in-depth review of the Phase 1 final report and the Phase 2 proposal and commercialization plan, Phase 2 awards will be made approximately 7 months after the completion of Phase 1.

For planning purposes, proposers should understand that Phase 1 awards are made in July, Phase 2 proposals are due the following February, and Phase 2 awards are made during August and September.

This solicitation does not obligate NOAA to make any awards under either Phase 1 or Phase 2. Furthermore, NOAA is not responsible for any monies expended by the proposer before award of any contract resulting from this solicitation.

5.2 Reports

Six copies of a final report on the Phase 1 project shall be submitted to NOAA upon completion of the Phase 1 research. The final report shall include a single-page project summary as the first page, identifying the purpose of the research, and giving a brief description of the research carried out, the research findings or results, and the commercial applications of the research in a final paragraph. The remainder of the report should indicate in detail the research objectives, research work carried out, results obtained, and estimates of technical feasibility.

All final reports must carry an acknowledgment on the cover page such as: "This material is based upon work supported by the Department of Commerce under contract number_____. Any opinions, findings, conclusions or recommendations expressed in this publication are those of the author(s) and do not necessarily reflect the views of the Department of Commerce."

Progress reports in a brief letter format will be required also.

5.3 Payment Schedule

The specific payment schedule (including payment amounts) for each contract will be incorporated into the contract upon completion of negotiations between the Government and the successful Phase 1 or Phase 2 contractor. Progress payments are normally scheduled.

5.4 Proprietary Information, Inventions, and Patents

5.4.1 Limited Rights In Information and Data

Information contained in unsuccessful proposals will remain the property of the proposer, except that the “Project Summary” page may be made available to a limited audience through the SBA Tech-Net system. The Government may, however, retain copies of all proposals. Any proposal which is funded will not be made available to the public, except for the "Project Summary" page.

The inclusion of proprietary information is discouraged unless it is absolutely necessary for the proper evaluation of the proposal.

Proprietary information submitted to NOAA will be treated in confidence, to the extent permitted by law, if it is confined to a separate page with a numbering system key, and marked with a legend reading: "Following is proprietary information which (name of proposing firm) requests not be released to persons outside the Government, except for purposes of evaluation."

Any other legend will be unacceptable to NOAA and may constitute grounds for return of the proposal without further consideration. Without assuming any liability for inadvertent disclosure, NOAA will limit dissemination of such information to its employees and, where necessary for evaluation, to outside reviewers on a confidential basis.

Since technical reports may eventually be made available to the public, such reports shall not contain any language limiting their use other than for SBIR data as described below.

5.4.2 Copyrights

The contractor may normally establish claim to copyright any written material first produced in the performance of an SBIR contract. If a claim to copyright is made, the contractor shall affix the applicable copyright notice of 17 U.S.C. 401 or 402 and acknowledgment of Government sponsorship (including contract number) to the material when delivered to the Government, as well as when the written material or data are published or deposited for registration as a published work in the U.S. Copyright Office. For other than computer software, the contractor gives to the Government, and others acting on its behalf, a paid-up, nonexclusive, irrevocable, worldwide license to reproduce, prepare derivative works, distribute copies to the public, and perform publicly and display publicly, by or on behalf of the Government.

For computer software, the contractor gives to the Government, and others acting on its behalf, a paid-up, nonexclusive, irrevocable, worldwide license for all such computer software to reproduce, prepare derivative works, and perform publicly and display publicly, by or on behalf of the Government.

5.4.3 Data Rights

Except for copyrighted data, the Government shall normally have unlimited rights to data in Phase 1, 2, or 3 awards, such as:

(a) data specifically identified in the SBIR contract to be delivered without restriction;

(b) form, fit, and function data delivered under the contract;

(c) data delivered under the contract that constitute manuals or instructions and training material for installation, operation, or routine maintenance and repair of items, components, or processes delivered or furnished for use under the contract; and

(d) all other data delivered under the contract unless identified as SBIR data.

According to Federal Acquisition Regulation 52.227-20, Rights and Data - SBIR Program (March 1994), the contractor is authorized to affix the following "SBIR Rights Notice" to SBIR data delivered under the contract:

SBIR RIGHTS NOTICE

These SBIR data are furnished with SBIR rights under Contract No._____ (and subcontract_____, if appropriate). For a period of 4 years after acceptance of all items to be delivered under this contract, the Government agrees to use these data for Government purposes only, and they shall not be disclosed outside the Government (including disclosure for procurement purposes) during such period without permission of the contractor, except that, subject to the forgoing use and use by support contractors. After the aforesaid 4-year period, the Government has a royalty-free license to use, and to authorize others to use on its behalf, these data for Government purposes, but is relieved of all disclosure prohibitions and assumes no liability for unauthorized use.

(END OF NOTICE)

The Government's sole obligation with respect to any properly identified SBIR data shall be as set forth in the paragraph above. The 4-year period of protection applies for Phases 1, 2, and 3.

5.4.4 Patents

Small business firms normally may retain the worldwide patent rights to any invention made with NOAA support. As described in more detail in FAR 52.227-11, NOAA receives a royalty-free license for Federal Government use, reserves the right to require the patent holder to license others in certain circumstances, and requires that anyone exclusively licensed to sell the invention in the United States must substantially manufacture it domestically. To the extent authorized by 35U.S.C.205, NOAA will not make public any information disclosing a NOAA-supported invention to allow the contractor a reasonable time to pursue a patent (less than 4 years). SBIR awardees must report inventions to NOAA within 2 months of the inventor’s notice to the awardee.

5.5 Awardee Commitments

Upon the award of a contract, the contractor will be required to make certain legal commitments. The outline that follows illustrates the types of provisions that will be included in the Phase 1 contract.

(a) Standards of Work. Work performed under the contract must conform to high professional standards.

(b) Inspection of Work. Work performed under the contract is subject to Government inspection and evaluation at all reasonable times.

(c) Examination of Records. The Comptroller General (or a duly authorized representative) shall have the right to examine pertinent records of the contractor involving transactions related to this contract.

(d) Default. The Government may terminate the agreement if the contractor fails to perform the work contracted.

(e) Termination for Convenience. The contract may be terminated at any time by the Government if it deems termination to be in the best interest, in which case the contractor will be compensated for work performed and for reasonable termination costs.

(f) Disputes. Any dispute about the contract, which cannot be resolved by agreement, shall be decided by the Contracting Officer with right to appeal.

(g) Contract Work Hours. The contractor cannot require an employee to work more than 8 hours a day or 40 hours a week, unless the employee is compensated accordingly (i.e., receives overtime pay).

(h) Equal Opportunity. The contractor will not discriminate against any employee or applicant for employment because of race, color, religion, sex, or national origin.

(i) Affirmative Action for Veterans. The contractor will not discriminate against any employee or applicant for employment because he or she is a disabled veteran or veteran of the Vietnam era.

(j) Affirmative Action for the Handicapped. The contractor will not discriminate against any employee or applicant for employment because he or she is physically or mentally handicapped.

(k) Officials Not to Benefit. No Government official shall benefit personally from any SBIR contract.

(l) Covenant Against Contingent Fees. No person or agency has been employed to solicit or secure the contract upon an understanding for compensation, except bona fide employees or commercial agencies maintained by the contractor for the purpose of securing business.

(m) Gratuities. The contract may be terminated by the Government if any gratuity has been offered to any representative of the Government to secure the contract.

(n) Patent Infringement. The contractor shall report each notice or claim of patent infringement based on the performance of the contract.

(o) American-Made Equipment and Products. When purchasing either equipment or a product with funds provided through the contract, purchase only American-made equipment and products to the extent possible, in keeping with the overall research needs of the project.

5.6 Additional Information

(a) Projects--The responsibility for the performance of the principal investigator, and other employees or consultants who carry out the proposed work, lies with the management of the organization receiving an award.

(b) Organizational Information--Before award of an SBIR contract, the Government may request the proposer to submit certain organizational, management, personnel, and financial information to assure responsibility of the proposer.

(c) **Duplicate Awards--If an award is made under this solicitation, the contractor will be required to certify that he or she has not previously been, nor is currently being, paid for essentially equivalent work by any agency of the Federal Government. Severe penalties may result from such actions.**

This program solicitation is intended for informational purposes and reflects current planning. If there is any inconsistency between the information contained herein and the terms of any resulting SBIR contract, the terms of the contract are controlling.

5.7 Research Projects with Human Subjects, Human Tissue, Data or Recordings Involving Human Subjects

Any proposal that includes research involving human subjects, human tissue, data or recordings involving human subjects must meet the requirements of the Common Rule for the Protection of Human Subjects, codified for the Department of Commerce at 15 CFR Part 27. Any questions regarding these requirements should be addressed to Dr. Joseph M. Bishop. Telephone: (301) 713-3565 or e-mail: joseph.bishop@noaa.gov.

5.8 Research Projects Involving Vertebrate Animals

Any proposal that includes research involving vertebrate animals (including fish) must be in compliance with the National Research Council's "Guide for the Care and Use of Laboratory Animals" which can be obtained from National Academy Press, 2101 Constitution Avenue, NW, Washington, D.C. 20055. In addition, such proposals must meet the requirements of the Animal Welfare Act (7 U.S.C. 2131 et seq.), 9 CFR Parts 1, 2, and 3, and if appropriate, 21 CFR Part 58. These regulations do not apply to proposed research using pre-existing images of animals or to research plans that **do not** include live animals that are being cared for, euthanized, or used by the project participants to accomplish research goals, teaching, or testing. These regulations also do not apply to obtaining animal materials from commercial processors of animal products or to animal cell lines or tissues from tissue banks.

6.0 SUBMISSION OF PROPOSALS

6.1 Deadline for Proposals

Deadline for Phase 1 proposal receipt (6 copies) at the Contract Administration Branch is noon (EST) on January 15, 2003.

NOAA assumes no responsibility for evaluating proposals received after the stated deadline or that do not adhere to the other requirements of this solicitation (see checklist at back). Such proposals may be returned to the proposer without review.

Federal Acquisition Regulation (FAR 52 215-1) regarding late proposals shall apply. Letters of instruction will be sent to those eligible to submit Phase 2 proposals. The Phase 2 proposals are due at about the same time as Phase 1 final reports - 7 months after commencement of the Phase 1 contract.

Proposers are cautioned to be careful of unforeseen delays which can cause late arrival of proposals at NOAA, resulting in them not being included in the evaluation procedures. No information on the status of proposals under scientific/technical evaluation will be available until formal notification is made.

6.2 Proposal Submission

Hardcopy submission of NOAA proposals should be sent in 6 copies to:

ATTN: SBIR Proposals
U.S. Department of Commerce, NOAA
Contract Administration Branch, Code OFA613
1305 East-West Highway, SSMC4, Station 7604
Silver Spring, MD 20910-3281
Telephone: (301) 713-0829

For local delivery, the Contract Administration Branch is located near the intersection of East-West Highway and Colesville Road, and close to the Silver Spring Metro stop.

Acknowledgment of receipt of a proposal by NOAA will be made. All correspondence relating to proposals must cite the specific **proposal number** identified on the acknowledgment.

(a) **Packaging--Secure packaging is mandatory. NOAA cannot process proposals damaged in transit. All 6 copies of the proposal must be sent in the same package. Do not send separate "information copies," or several packages containing parts of a single proposal, or two packages of 6 copies of the same proposal. The top copy must be signed as an original by the principal investigator and the corporate official. Other copies may be photocopies.**

(b) Bindings--**Do not use special bindings or covers.** Staple the pages in the upper left hand corner of each proposal. Separation or loss of proposal pages cannot be the responsibility of NOAA.

6.3 Warning

While it is permissable, with proper notification to NOAA, to submit identical or essentially equivalent proposals for consideration under numerous Federal program solicitations, it is unlawful to enter into contracts requiring essentially equivalent effort. If there is any question concerning this, it must be disclosed to the soliciting agency or agencies before award.

7.0 SCIENTIFIC AND TECHNICAL INFORMATION SOURCES

7.1 General Information

The following web pages may be sources for additional technical information:

http://www.NOAA.gov http://www.lib.noaa.gov

7.2 Oceanography and Marine Science

Scientific information in the areas of oceanography and marine science may be obtained from the following organizations:

University of Alaska
P.O. Box 755040
Fairbanks, AK 99775
907/474-7086

University of California- San Diego
9500 Gilman Drive
LaJolla, CA 92093
619/534-4440

Hancock Institute for Marine Studies
University Park
Los Angeles, CA 90089
213/740-1961

University of Connecticut
1084 Shennecossett Road
Groton, CT 06340
203/445-3457

University of Delaware
Robinson Hall, Rm 111
Newark, DE 19716
302/831-2841

University of Florida
Building 803
Gainesville, FL 32611
904/392-5870

University of Georgia
Ecology Building
Athens, GA 30602
706/542-6009

University of Hawaii
1000 Pope Road, Rm. 223
Honolulu, HI 96822
808/956-7031

University of Illinois
65 Mumford Hall
1301 W. Gregory Drive
Urbana, IL 61801
217/333-9448

Purdue University
1159 Forestry Building
W. Lafayette, IN 47907
317/494-3573

Louisiana State University
128 Wetland Resources
Baton Rouge, LA 70803
504/388-6710

University of Maine
14 Coburn Hall
Orono, ME 04469- 0114
207/581-1436

University of Maryland
0112 Skinner Hall
College Park, MD 20742
301/405-6371

Massachusetts Institute
of Technology
Bldg. E38, Room 330
77 Massachusetts Avenue
Cambridge, MA 02139
617/253-7131

Woods Hole Oceanographic Inst.
CRL 209
Woods Hole, MA 02543
508/457-2000 ext. 2665

University of Michigan
4107 I.S.T. Building
2200 Bonisteel Blvd.
Ann Arbor, MI 48109
313/763-1437

University of Minnesota
2305 East 5th Street
Duluth, MN 55812
218/726-8106

MS-AL Sea Grant Consortium
P.O. Box 7000
703 East Beach Drive
Ocean Springs, MS 39564
601/875-9341

University of New Hampshire
Ocean Process Analysis Lab.
142 Morse Hall
Durham, NH 03824
603/862-3505

NJ Marine Sciences Consortium
Building No. 22
Ft. Hancock, NJ 07732
908/872-1300

State University of New York
115 Nassau Hall
Stony Brook, NY 11794
516/632-6905

North Carolina State University
Box 8605
Raleigh, NC 27695
919/515-1454

Ohio State University
1541 Research Center
1314 Kinnear Road
Columbus, OH 43212
614/292-8949

Oregon State University
Administrative Services
Corvallis, OR 97331
503/737-3396

University of Puerto Rico
Dept. of Marine Science
P.O. Box 5000
Mayaguez, PR 00681
809/832-3585

University of Rhode Island
Marine Resources Bldg.
Narragansett Bay Campus
Narragansett, RI 02882
401/792-6800

South Carolina Sea Grant
Consortium
287 Meeting Street
Charleston, SC 29401
803/727-2078

Texas A&M University
1716 Briarcrest Drive
Suite 702
Bryan, TX 77802
409/845-3854

Virginia Graduate Marine
Science Consortium
Madison House 170 Rugby Road
Charlottesville, VA 22903
804/924-5965

University of Washington HG-30
3716 Brooklyn Ave, N.E.
Seattle, WA 98105- 6716
206/543-6600

University of WI- Madison
1800 University Avenue
Madison, WI 53705
608/262-0905

8.0 RESEARCH TOPICS

8.1 TOPIC: ATMOSPHERIC SCIENCES

8.1.1R Subtopic: Robust High Precision Analyzers for Atmospheric Methane and Carbon Monoxide

Rising concentrations of greenhouse gases in the atmosphere due to human activities are posing an increasing risk of global climate change. Atmospheric methane has more than doubled since the 19th century, and is responsible for about 20% of the increased greenhouse radiative forcing of the climate. Carbon monoxide has increased as well, and plays a major role in atmospheric chemistry, thus influencing the chemical lifetime and build up of many other trace gases in the atmosphere. The Kyoto Protocol in 1998 was a first step toward international agreements limiting the emissions of several greenhouse gases and fostering the sequestration of carbon on the land or in the oceans. Carbon monoxide is also an important tracer for the diagnosis of the anthropogenic component of precise atmospheric carbon dioxide measurements. The North American Carbon Program calls for, as its highest priority near-term enabling development, the development of accurate in-situ sensors and sampling protocols for atmospheric measurements of CO2, CO, and CH4 (www.esig.ucar.edu/nacp/).

Specifications for CO and CH4 are as follows. The analytical systems require very little maintenance for extended periods of field use, up to half a year, and are operable by people without extensive scientific training. It is acceptable to use ambient air reference gas mixtures for periodic automated calibration of the instruments, but the amount of gas required should be kept below 1 liter (NTP) per day. Precision: 10 ppb in one minute (~0.5% of ambient mole fraction in air for CH4, and ~7% of ambient for CO, respectively). The instrument is not sensitive to motion. Preliminary estimates of price and cost breakdown for a full analytical system, if manufactured in quantity, are required in the proposal.

8.1.2R Subtopic: Space Weather Industry

A significant demand for space weather information is anticipated as high-tech systems that can be affected by extraterrestrial radiation are being brought on-line. Companies in the business of selling and supporting satellite constellations, cellular phone transmission, space travel, and power distribution, to name a few, will require space "weather" forecasts, improved models, and data. In order to meet these demands, NOAA is seeking innovative models and products for users. In developing such concepts, it will be useful to consider the embryonic space weather industry as an analog to present developments in the meteorological and communications industries. The National Weather Service now supports a growing private industry based on its data and services. The purpose of this subtopic is to request proposals that will assist private industry in the development of space weather services. An understanding of the type of products that are now available can be obtained in products shown on NOAA Weather Wire space weather products, and at the Website at (sec.noaa.gov/Data). Most of the data that are available to companies that wish to develop space weather services are on the Website. E-mail questions to leon.laporte@noaa.gov. Answers will be posted on the web page.

8.1.3R Subtopic: Detectors and Filters for GOES Solar EUV Observations

There is a NOAA requirement for the observation of solar EUV irradiance from 1 to 130 nm in 10-30 nm wide bands. The wavelengths from 1 to 50 nm and the band around 120 nm have been achievable with combinations of filters and transmission gratings. The wavelengths between 50 and 100 nm have proven to be more problematic. The combination of gratings, thin metal filters, and silicon diode detectors have either proven to be unstable over the required 5-7 year life of the mission, or the filter/grating combination has not blocked enough visible light to allow the EUV signal to dominate.

Alternative filters, detectors, and/or wavelength isolation techniques need to be explored for use in space-based solar EUV sensor systems. These are required for the NOAA GOES (Geostationary Operational Environmental Satellite) mission. The sensor systems should provide a method of measuring 10-20 nm wide bands between 50 and 100 nm with high levels of accuracy and repeatability through the entire dynamic range of the solar EUV flux levels. They should be stable in the geosynchronous space environment for more than 7 years. They should reduce the visible light signal in the detector to a level that it contributes only a small faction of the total signal. E-mail questions to leon.laporte@noaa.gov. Answers will be posted on the web page.

8.1.4R Subtopic: Aerosol Instrumentation for Deployment on Light Aircraft

The NOAA Office of Global Programs has broad interest in the in-situ measurement of the vertical distribution of the chemical, physical, and optical properties of atmospheric aerosols, in their cloud-altering properties, and in determination of the impact of those properties on the radiative balance of the Earth-atmosphere system. To address expanding requirements in this area, proposals are requested for development of fast, compact systems, including analytical instruments, inlets, samplers, etc., capable of autonomous operation, that can be deployed on light aircraft operating in the lower troposphere. Priority will be given to systems that address limiting factors in current in-situ measurement capabilities.

8.1.5R Subtopic: Eyesafe Laser Source for Airborne Lidar Aerosol Profiling

NOAA's Environmental Technology Laboratory solicits proposals for SBIR research associated with eyesafe infrared sources for lidar aerosol profiling. The laboratory has need of a laser source operating in the eyesafe wavelength region around 1.5 microns that can be incorporated into an airborne aerosol lidar. The laser to be developed under this subtopic should have sufficient energy to observe thin aerosol layers at ranges extending beyond 6 km. Because beam divergence can be excessive in some eyesafe infrared lasers, the beam divergence of the laser has to be sufficently limited to be feasible for use in lidar. The instrument developed from this laser will be used on the NOAA P-3 aircraft as part of air quality studies to identify and characterize aerosol layers in the boundary layer and free troposphere.

8.1.6R Subtopic: Improved Detectors for 1.5 Micrometer Lidar Performance

Currently, application of lidars operating in the eyesafe region around 1.5 micrometers is limited by detector technology. Better detector technology with low noise, high gain, and larger chip sizes are required to improve 1.5 micrometer lidar performance. Proposals are solicited by NOAA's Environmental Technology Laboratory for new detector technology that can be demonstrated in existing 1.5 micrometer lidar systems for profiling aerosol structure in the boundary layer and free troposphere.

8.1.7W Subtopic: Interlinked Distributed PC/Workstation System Grid With Ontology Capabilities to Internet

The NOAA/National Weather Service (NWS) has an extensive network and array of computers, PCs, workstations, and servers to fulfill the mission of providing national forecasts and warnings. The Automated Weather Interactive Processing System (AWIPS) is the NWS keystone component for integrating weather observations and data into environmental information. There are over 130 AWIPS, which consist of UNIX/LINUX based system of servers, work stations, and communications networks. Presently, the AWIPS and other NWS computers, form an extensive computational capability, essentially operate in a compartmental or independent manner. This SBIR subtopic would explore, develop, and design a methodology and approach for interlinking and optimally using NWS computers in a distributed or gridded processing network service system. The potential exists for creating a computational network from existing NWS computers that could perform and run complex and extensive software, data processing, and models that are presently confined to large dedicated computer or super computer systems. With extended network services, otherwise idle processing resources could be applied to NWS computational requirements**.** This system would extend to internet and NWS intranet capabilities. Examples of distributed system capability are: the SETI (http://setiathome.berkeley.edu/), Gnutella (http://www.gnutella.com/), and GIMPS (Great Internet Mersenne Prime Search: http://www.mersenne.org.)

Along with developing and designing the strategy/capability/software for interlinking the PCs/computers/workstations into a distributed system, it is expected that a weather information related ontology facilitating the application of this new distributed system would be defined and described. Incorporating this design would facilitate the global sharing and reuse of data, information, and knowledge throughout the distributed service network. This ontology and associated interface/software would encompass interpretive commonality for weather, climate, and atmospheric knowledge bases, subjects, and terms. Further, this ontology would need to be directly transportable and compatible with the AWIPS and NOAA/NWS PCs, networks, and computers.

8.1.8R Subtopic: Advanced Methods to Improve Radiometric Profiling

Ground-based radiometric profiling is a powerful tool for continuous atmospheric temperature and moisture sensing with application to a ground-based network of sensors for forecasting applications. Radiometric profilers passively observe microwave brightness temperatures at multiple frequencies near the water vapor resonance at 22 GHz and the oxygen complex at 60 GHz. Reliable and accurate tropospheric temperature and humidity profiles can be estimated from these observations during clear and cloudy conditions. A low resolution one-layer cloud liquid profile can also be estimated. Profile retrievals can be obtained 4 or more times per hour and with no expendables. Radiometric profiling, combined with wind profiling and slant GPS observations, can provide order of magnitude improvements in high resolution water vapor and wind analyses. Applications within the Environmental Technology Laboratory include convective storm forecasting as well as high resolution dispersion forecasting for homeland security.

Current commercial radiometric profilers make serial measurements at 12 microwave frequencies during an observation cycle. Profile retrieval algorithms are based on the assumption that the atmosphere remains constant during the observation cycle. However, during rapidly changing cloud conditions, brightness temperatures can vary

significantly during the observation cycle. If this occurs, the accuracy of the retrieved profiles can be degraded. Current radiometric profile retrieval methods are based on zenith observations and neural network or regression algorithms. Advanced methods could assimilate observed radiometric brightness temperatures directly into models, thereby bypassing the retrieval stage. In addition, elevation angle scanning could improve profile retrieval accuracies by providing spatial information on the variability of water vapor and cloud liquid.

8.1.9R Subtopic: Dropsondes Using Innovative Intergrated Fabrication Technologies

Dropsondes deployed from either aircraft or balloons remain a key tool for observing the atmospheric state with high vertical resolution. They are used in both weather research and operational forecasting, having become an integral part of the NWS winter storms observation program and OAR short term severe weather forecasting efforts. Dropsondes are expected to remain the primary means of validating satellite retrieved temperature, moisture, and wind profiles over significantly sized regions of globe, in particular, those areas (specifically the oceans) for which ground-based validation is either expensive or impractical. They will also be central to the development of global observation strategies using the forthcoming generation of unmanned aerial vehicles (UAVs) such as the Global Hawk or Helios/Peacewing platform. Potential new applications include high resolution dispersion forecasting for homeland security.

Major drawbacks to existing dropsondes are their weight, size, and cost. Current GPS dropsondes occupy ~200 cc3, weigh ~500 g, and cost over $500 each. New manufacturing techniques employing large scale digital and analog integration could be used to simultaneously reduce the cost - much of which is dominated by assembly - with concomitant reductions in size and weight. Integration is also expected to improve reliability and consistency, as well as minimize impacts on the environment and aeronautical safety. Revolutionary new micromechanical fabrication techniques might allow complete integration of all sensors and telecommunications subsystems on a single substrate small enough so as alleviate the need for an arresting parachute. Fast-response integrated sensor elements could also facilitate more dense vertical sampling in critical regions such as the near-surface boundary layer.

This subtopic seeks innovative means by which the current generation of air-deployed dropsondes can be improved using innovative integrated fabrication technologies. Proposed new designs should take maximum advantage of state-of-art integration techniques involving mixed analog, digital, RF, and micromechanical fabrication technologies. Significant cost reductions along with performance enhancements are expected from new lightweight designs developed for deployment at mass scale. Advanced sensing, sampling, and data telecommunication strategies should also be considered.

8.2 TOPIC: OCEAN OBSERVATION SYSTEMS

8.2.1N Subtopic: Operational Ocean Instrumentation, Measurements, and Data/Information Dissemination Systems

Development of operational ocean instrumentation, measurement, and data/information dissemination systems is sought to support a wide range of NOAA's National Ocean Service (NOS) operational activities, such as the Physical Oceanographic Real-Time System (PORTS) Program, the National Water Level Observation Network (NWLON) Program, coastal and estuarine forecast systems, and environmental monitoring associated with sustaining healthy coasts and mitigation of coastal hazards. NOS requirements include systems for short-term (hours to weeks) deployment to support specific scientific projects as well as systems for long term (months to years) deployment, where they might be incorporated into existing monitoring sites (e.g., PORTS or NWLON). Development generally includes sensing, data acquisition, processing and analysis, and information dissemination. One emphasis area is for systems that can be operated in an unattended mode. These systems should provide near real-time data acquisition and dissemination. Another area of emphasis is remote sensing systems which allow rapid acquisition of data from large coastal areas. High reliability, known accuracy, and cost effectiveness are important design considerations. The parameters of interest are comprehensive, including (1) physical, chemical, and biological properties of the coastal ocean environment; (2) pollutants; and (3) overlying atmospheric parameters. These systems provide marine environmental information in support of safe navigation, safe transportation of hazardous materials, economic benefits to marine commerce, management of marine resources, assessment of coastal ecosystems health, and mitigation of natural hazards.

Of particular interest this year are proposals relative to the following:

a) **Automated Self Cleaning, Self Calibrated Water Quality Sensing System --** Water quality in estuarine waters such as bays and harbors is important to coastal commerce, recreation, and ecological health. An efficient and reliable in-situ system with known accuracy that can measure key water quality parameter(s) such as dissolved oxygen, nutrients, or chlorophyll is sought. Existing instruments do not meet the criteria of long-term, unattended, and real-time operational capabilities due to mainly marine fouling and sensor calibration problems. Unattended long service interval (3-month or longer) and real-time reporting are required. An automated self cleaning, self calibrated water quality sensing system is sought. It could be a system using an automated retractable platform, water pump-through system, or other innovative approaches. Solutions to technical problems associated with long-term calibration stability (such as internal chemical process, marine fouling and corrosion), measurement protocols, and QA/QC methodology should be addressed. The technology is a candidate for integration with the existing National Ocean Service's PORTS or NWLON monitoring systems (see: http://www.co-ops.nos.noaa.gov). System output should be compatible with standard interfaces to commercial data communication devices such as RS-232 ports, telephone, wireless phone, line-of-sight radio, or over the Internet.

b) **High Resolution Surface Current Mapping in Harbors --** The National Ocean Service has installed PORTS in many harbors to promote safe and efficient marine transportation. A primary requirement of the maritime community for these systems is the observation of water currents at selected locations. CO-OPS uses upward-looking Acoustic Doppler Current Profilers (ADCP) mounted on the bottom and cabled to shore. While this configuration provides a good current profile throughout the water column, it is a single-point observation that is relatively costly and difficult to maintain. In confined

waterways with winding channels, the maritime community requires many more ADCPs than can be reasonably procured or maintained. For example, pilots identified fourteen locations in the Hampton Roads portion of the southern Chesapeake Bay alone. Remote sensing in the form of radar surface current mapping systems is an approach more suited to the spatial coverage required, but existing systems cover too wide an area with resolution too coarse for harbors and waterways. Existing shore-based High Frequency (HF) Doppler radar surface current mapping instruments cover up to 50 thousand square kilometers with a grid spacing of 6 x 6 kilometers, or as small as 150 square kilometers with a grid spacing of as little as 200 x 200 meters (See the following web page - http://www.codaros.com/products/HiResSpecs.htm). CO-OPS seeks a robust sensing system to observe water currents on space and time scales suited to harbors, (i.e., order of 10 x 10 meter grid spacing, near real-time reporting at hourly or shorter time intervals), with errors less than 10 cm/sec. The ideal system must operate in both fresh and salt water, and under most conditions experienced in the harbor/bay environment. Preference is given to shore-based observations for ease of maintenance and access to data. Another critical feature is that the system should be modestly priced in order to sustain a healthy commercial market.

c) **Miniaturized Low Cost Electronic Oceanographic Sensors --** Most of the kinds of information that coastal scientists want to collect (e.g., salinity, temperature, dissolved oxygen concentration, turbidity, wave height, etc.) can be obtained using conventional field instruments that are either moored in place or mobile between sampling sites. These measurements could also include fluorescence, beam attenuation, and light backscatter measurements. Currently, such instruments may range in price from one to twenty-five thousand dollars or more, depending on how many variables they are capable of measuring. A useful addition to the array of instruments would be low cost packages that can measure and record one or more variables in situ over a short time interval (e.g., hours, days, or weeks). If these small packages were relatively inexpensive and reusable, investigators could leave them at a sampling site for short periods without risking too much and without investing too much in instrumentation to cover multiple sites. Currently data density is limited by cost constraints for instrumentation, but it should be driven by the phenomenon of interest.

d) **Systems for Remote Sensing of In-Situ Optical Properties --** Optical techniques are amenable to a variety of platforms (satellites, aircrafts, mooring, and profiling instrumentation) allowing researchers to design multi-platform sampling networks capable of collecting data over ecologically relevant scales. Significant effort over the last decade has focused on developing techniques to measure the spectral dependency of in situ inherent optical properties (IOPs). The advantage of the IOPs is that they depend only on the medium and are independent of the ambient light field, thereby making them easier to interpret and allowing for the partitioning of bulk optical properties into the individual components. The relevant IOPs include absorption, attenuation and scattering, which can be combined with spectral fluorescence. The instruments need to be small enough that they can readily be incorporated into the available payloads of the platforms and make measurements with sufficient sensitivity to define gradients from coastal to open ocean waters. Emphasis should also be on making the measurements with as much spectral information as possible. Additionally, recent major improvements in the spectral resolution, calibration and stability of these sensors suggest the possibility of addressing the "inverse problem" in spectral optics. In the context used here, the "forward problem" addresses the prediction of optical underwater propagation based on the physical properties of the medium and the particles it contains. Innovative methods, supporting studies, analyses, and new engineering approaches are sought in support of developing a sensor or suite of sensors to solve the "optical inverse problem", i.e., determining what is in the water from high resolution spectral measurements of its optical

properties. The work needed to advance towards a cost-effective commercial instrument may involve a combination of theory and mathematical modeling of the scattering and absorption process; laboratory and in-situ measurements of multi- and hyper-spectral optical propagation; methods to develop spectra signatures of particulate and dissolved constituents (e.g., common HAB species and assemblages); and the development of efficient, data intensive algorithms to make estimates of phytoplankton biomass in-situ by assemblage, genera or species from direct measurements of optical backscattering and absorption.

e) **Automated Sampler for Phytoplankton, Zooplankton, and Larger Animals --** Relatively high frequency sampling is often needed in studying physiology, growth rate, biochemical process, and population dynamics of phytoplankton (and other plankton as well). An automated system is sought which could be controlled by a preset program to collect water samples (or in the case of larger plankton, filtered plankton samples) which would be sealed after injection of a small volume of fixative. In the case of water samples for DNA/RNA and protein analysis, volume of samples need to be 1 liter or larger. The capacity of the sampler system should be at least 12 samples. Therefore, the system would consist of a pump to draw water samples; another pump to inject fixative; as well as electronics to control operation of the pumps, closure of the sample containers, and injection of the fixative. A container of the fixative will need to be attached to the system. The system would be deployed at fixed depth for the duration of the sampling program.

f) **Video Recorder to Image Microzooplankton and Fish --** A towed video instrument for surveying and identifying macrozooplankton and micronekton in the water column is needed. The device will fill a scale gap between existing imaging instruments designed for small particles and zooplankton, such as the Video Plankton Recorder, and existing acoustic systems, which have greater range but lack the ability to identify different taxa of organisms. Needed is a device that will illuminate and image objects ranging from 0.5 to 100 cm in size, within a field of view ranging from 2 to 4 m^2. Towed , the instrument would survey volumes of water approaching those filtered by mid-water trawls, and would operate to full ocean depth. Concurrent environmental data will include depth, temperature, salinity, fluorescence, oxygen, and ambient light. Power, operational data, and video signals would be transmitted between the instrument and the surface.

g) **Instrumentation for In-Situ Real-Time Detection and Quantification of HAB Species and Toxins --** The recognition that Harmful Algal Bloom (HAB) species are becoming more common in range and abundance has prompted the urgent need for accurate and dependable detection of these organisms or their toxins. To date, detection is labor intensive and takes a high degree of skill requiring years of training and updating to be done reliably. This aspect is not likely to change in the near future, but there is a need to provide wider coverage (synoptic) of local waters in detecting the presence of HABS through semi- to fully automated methods. There is some hope in using and perfecting what is presently available. Three promising methodologies are: Molecular probes for cell recognition – (surface cell recognition probes), PCR probes for rDNA specific to genera or species of HABS, and Enzyme Linked Immunosorbent Assays (ELISA's). Some instrumentation advances include the liquid chromatography/mass spectrometry instruments. The objective of this development is to encourage and perfect molecular probes and ELISAs for the major HAB species and their toxins; to develop new methodologies along this line in the accurate detection of these species; to have these rigorously tested against trained observers and alternate methods of measuring HABS or toxins; and to engineer these methods to be included as an instrument package upon moored sensor packages to be deployed in estuaries and coastal waters as part of a sensing network. This network, with the assistance of ground truthed samples, would

allow the detection of HABs possibly at their origin and could give direction as to the development and termination of blooms.

8.2.2W Subtopic: Low Maintenance Salinity/Conductivity Sensor

NOAA's National Data Buoy Center (NDBC) operates a network of moored buoys and fixed coastal marine stations, as well as the Volunteer Observing Ship (VOS) Program, that measure a variety of meteorological and oceanographic variables for the National Weather Service for use in weather forecasting and climate prediction. In the VOS Program, NDBC installs meteorological and oceanographic sensor measurement packages on privately owned and commercial vessels which provide these data to NOAA from disparate geographical areas. These moored buoys, fixed coastal marine stations, and Volunteer Observing Ships are typically located in remote areas and see infrequent maintenance.

As the NDBC has increased the number of oceanographic measurements made from its platforms, it has added salinity/conductivity measurements to selected stations. In general, NDBC platforms are located in near-coastal waters and Volunteer Observing Ship sensors are typically mounted on ships near the surface of the ocean. These areas of the ocean are very active biologically, and as a result, salinity sensors become rapidly fouled with marine growth. This marine growth on salinity/conductivity sensors rapidly degrades the accuracy of salinity measurements, necessitating frequent maintenance of the sensor to maintain its accuracy. In order to avoid frequent costly maintenance of sensors that may be at remote locations which cannot be easily reached on a regular basis for routine maintenance, NDBC is seeking a low- or no maintenance salinity/conductivity sensor.

A salinity/conductivy sensor for coastal measurements would have a resolution of 0.01 parts per thousand, with an accuracy of 0.1 parts per thousand. A low/no maintenance salinity sensor would operate and maintain this resolution and accuracy in the presence of marine growth and bio-fouling for a minimum of 1 year without maintenance and, ideally, operate in this environment to this accuracy for as long as 3 years. A variety of technologies exist for measurement of conductivity which is used to determine salinity, but the majority of technologies suffer from degradation of measurement accuracy rapidly as the sensor becomes fouled. A review of salinity measurement requirements and technologies available for the coastal ocean is thoroughly discussed in reference [1].

References:

[1] Measurements of Salinity in the Coastal Ocean: A Review of Requirements and Technologies, Marine Technology Society Journal, vol. 34, no. 2, Summer 2000.

[2] National Data Buoy Center web site, http://www.ndbc.noaa.gov, for background information on NDBC and its programs.

8.2.3W Subtopic: Air-Deployed, Self-Moored, Expendable (ADSMEX) Buoy

The National Data Buoy Center (NDBC) maintains a network of 70 moored buoys around the east, west, Alaskan, and Hawaiian coastlines. This observation network supports the National Weather Services' warning and forecast mission. Although NDBC plans for normal maintenance and exchange activities, there are unforseen outages or station losses that affect data availability at critical times. NDBC Discrepancy Response Policy requires (when practical, and consistent with safety guidelines) that service should be

attempted within 4 weeks for coastal buoys, and 6 weeks for deep ocean buoys. Ship availability, weather, etc., often cause negative impacts and prevent restoration of data in a reasonable time frame.

When station outages occur, NDBC's ability to provide a positive response by restoring data is sometimes delayed for weeks or months due to circumstances beyond NDBC's control. Although drifting buoys may be an important mitigation option, they have limitations. Several drifters of various types must be used to obtain all needed measurements, and the expense associated with purchasing many platforms and satellite communications services associated with using more than one platform. Also, it can be difficult for operational forecasters to compare and analyze the various measurement parameters from multiple locations.

This SBIR subtopic addresses the development of a cost-effective, expendable buoy capable of being air deployed from C-130 aircraft or ship of opportunity; mooring itself in 2,500 to 3,000 fathoms of water; reporting all critical parameters (wind speed and direction, waves, pressure, etc.); having hourly, event driven, or on-demand satellite communications with a GTS compatible format; and continuously operating for 6-12 months. This platform could be used as a mitigation tool for NDBC during critical data outages; by NDBC and other federal agencies and research institutions to establish short-term measurement programs; and by industry to address special data needs. Developing this kind of platform offers the opportunity for NDBC and NOAA to develop and implement new cost-effective mitigation strategies, enter more partnerships and data sharing agreements with other users, and to obtain measurements from other regional observing networks in a common data format to benefit the Coastal Ocean Observation Program.

8.2.4R Subtopic: Electronic Arrays for Marine Chemical Quantification and Classification

The purpose of this subtopic is to develop a prototype marine instrument deployable on a towed or profiling platform capable of providing chemical compound identification and quantification. Identifying and quantifying the chemical compounds that make up marine nutrients and contaminants currently requires time consuming and costly field sample collection and laboratory analyses. Technologies such as quartz crystal microbalance, surface acoustic-wave, and silicon integrated circuit structures can be applied in the marine environment to allow direct extraction of data in the field or to provide survey information during field sampling efforts. These technologies do not employ colorimetric measurement requiring chemical reagents. Instrumentation utilizing this technology will be applicable to marine environmental research, environmental monitoring, and municipal drinking water quality assessment.

Detection specifications for contaminants and nutrients of interest:

	Range	Resolution
Persistent Organic Contaminants	0-1 ppm	1 ppt
Phosphate	0.5-3.0 ug P/L	0.1 ug P/L
Silica	0.1-2.0 mg SiO2/L	0.1 mg SiO2/L
Dissolved Oxygen	0-12 mg/L	0.01 mg/L
Nitrate-nitrogen (NO3)	0.01 - .5 mg N/L	0.01 mg N/L
Ammonium-nitrogen (NH4)	5 - 50 ug N/L	1.0 ug N/L
Chloride	10-50 ug Cl/L	1.0 ug Cl/L

8.2.5F Subtopic: Inexpensive Submersible Long-Term Dissolved Oxygen Recorder

Eutrophication caused hypoxia and anoxia occur over vast areas of the coastal sea significantly reducing fisheries *productivity.* An inexpensive, reliable, easy-to-use device is needed to map the oxygen depletions and monitor efforts at remediation. The model for this new device could be the $100 HOBO temperature recorder sold by Onset Computer Corp. of Massachusetts. HOBOs are half the size of a golf ball, completely sealed in plastic, collect data for five years, and use IR light communications to set and retrieve data so they are never opened. In a cooperative study run by the Fisheries Oceanography Branch of the NEFSC, these devices are being attached to lobster traps throughout the Gulf of Maine and NYDEC is doing similar work in Long Island Sound. These studies can result in nearly continuous bottom water temperatures wherever fixed gear is fished.

The second piece of the puzzle could be based on oxygen sensors that use the fluorescence of a ruthenium complex to measure partial pressure of oxygen. (Ocean Optics in Florida has employed the chemical principle in a bench top, computer-driven optode system but it is not submersible and is 1000 times too big.) If chip lasers and sensors could be combined with the ruthenium-based sensor, an oxygen equivalent of the HOBO could be made.

References:

Bacon and Demas, 1987. Determination of Oxygen Concentrations by Luminescence Quenching of a Polymer Immobilized Transition Metal Complex. Anal. Chem. 59:2780-85.

Colvin et al., 1996. A Novel Solid-State Oxygen Sensor. Johns Hopkins Apl. Technical Digest 17(4):377-384.

Coutant, M.A., Durra, P.K., 2000. Tris(2,2'-bipyridine)ruthenium II Entrapped in Nanocrystalline Zeolite-Y Films: A Novel Oxygen Sensor. Pittcon 2000, New Orleans, LA., March 2000.

Gryczynski et al., 1999. Polarization-based oxygen sensor. Analyst 124:1041-44.

McDonagh et al., 1998. Optical Sol-Gel-based Dissolved Oxygen Sensor: Progress Towards a Commercial Instrument, J. Sol-Gel Sci. Tech ,13 207-211.

McDonagh et al., 1998. Tailoring of Sol-Gel Films for Optical Sensing of Oxygen in Gas and Aqueous Phase. Anal. Chem. 70: 45-50.

McDonagh et al., 2001. Phase Fluorometric Dissolved Oxygen Sensor. Sensors and Actuators B 74(1-3):123-129.

8.3 TOPIC: LIVING MARINE RESOURCES

8.3.1F Subtopic: Fluorescence Imagery for Rapid Estimates of the Distribution and Abundance of Coral Recruits

Recruitment of juveniles influences coral population dynamics as well as reef community structure. Coral recruitment is generally determined by one of three methods: artificial settlement plates (Harriott and Fisk 1987), small-scale macro photography (Smith 1997), or painstaking visual searches in the field (Miller et al. 2000). These methods can be labor-intensive or time-consuming, as they require microscopic examination of the settlement surface or enough time for the coral to grow large enough to be visible to the naked eye. However, recent advances in the use of fluorescence imagery allow the detection of reef invertebrates as small as 1 mm diameter (Mazel, personal communication). We request a pilot study to determine the capability of fluorescent technologies to identify and enumerate coral recruits, and to rigorously compare these techniques with current methods used to quantify coral recruitment on natural and artificial substrates. Fluorescence imagery has the potential to be a simple, sensitive tool for rapid estimates of the distribution and abundance of coral recruits at a variety of spatial scales. This approach would be valuable in determining size-frequency distributions of coral species, which is an important metric for reef assessment and restoration. In addition, fluorescence could provide non-invasive, site-specific estimates of coral recruitment for use in our spatially explicit coral recovery model (Whitfield et al. 2001). The coral model is adapted from our seagrass model, which has been used successfully to resolve claims for seagrass mitigation and rehabilitation (Fonseca et al. 2002).

References:

Harriott, V.J. and Fisk, D.A., 1987. A comparison of settlement plate types for experiments on the recruitment of scleractinian corals. Mar Ecol Prog Ser 37:201-208.

Smith, S.R., 1997. Patterns of coral settlement, recruitment, and juvenile mortality with depth at Conch Reef, Florida. Proc 8th Int Coral Reef Symp 2:1197-1202.

Miller, M.W., Weil, E., and Szmant, A.M., 2000. Coral recruitment and juvenile mortality as structuring factors for reef benthic communities in Biscayne National Park, USA. Coral Reefs 19:115-123.

Whitfield, P.E., Fonseca, M.S., and Kenworthy, W.J., 2001. Coral damage assessment and restoration tools for small vessel groundings. Project Report to NOAA Damage Assessment Center, Silver Spring, Maryland. 15pps.
Fonseca, M.S., Whitfield, P.E., Kenworthy, W.J., Colby, D.R., and Julius, B.E., 2002. Modeling the effect of injury geometry on seagrass recovery. Submitted to Ecological Applications.

8.3.2F Subtopic: Development of Long-Term, Non-injurous Attachment Platforms for Telemetry of Dolphins

Research on stock structure, ranging patterns, and habitat use of free-ranging dolphins would benefit greatly from long-lived telemetry devices, particularly satellite-linked radio transmitters. These transmitters emit signals that are received by a system installed on NOAA polar-orbiting satellites. These devices are very effective at collecting the information required, such as dolphin location, water temperature, depth of dives, swimming speed, and other parameters, but their use is limited because attachment times have been limited to, on average, about 100 days, a minimal time in the life of a dolphin. At least an annual cycle is desirable. Furthermore, the tags themselves are expensive so a short retention time is a deterrent to their use. There is a great need for the development of attachment packages that would have a much greater longevity and cause less injury to tagged dolphins.

8.3.3F Subtopic: Robust, Easy to Use Equipment for Calibrating Fishing Gear Use to Survey Fish and Invertebrate Populations from Commercial Fishing Vessels

The objective is to develop a sensor to monitor the performance of commercial fishing gear (bottom trawls, mid water trawls, scallop dredges and clam dredges) deployed from diverse commercial fishing vessels, and to develop samplers to collect key environmental data (e.g. bottom type) from commercial vessels. Resource surveys are used to monitor trends and measure abundance of fish and invertebrates and are key to management of U.S. fisheries. The current primary approach uses research surveys with standardized fishing gear deployed by government-owned research vessels. However, surveys with commercial fishing gear and commercial fishing vessels are becoming more common as stakeholders become involved in data collection and as new information is required to solve difficult problems. Recent research has shown that sensors to measure depth and bottom contact can be used to estimate and adjust for the relative efficiency of different types of fishing gear and fishing vessels. Furthermore, environmental characteristics such as bottom type, time of day (illumination) and temperature can be important in interpreting data from non-standard survey gear and vessels. Sensor and sampling equipment are already available to collect this type of information from both research and commercial vessels. However, currently available equipment is usually expensive, time consuming to install and calibrate, not designed with data management and analysis in mind, and requires attention from a skilled operator to collect high quality data for scientific purposes. Samplers designed to measure physical characteristics of the environment (e.g. bottom type) are usually not suitable for use on commercial vessels. This subtopic is to develop sensors and samplers for use in fish and invertebrate surveys that are robust, easy to install and easy to use for collection of gear performance and environmental data.

8.3.4F Subtopic: Portable DC Power Source for Operating Passive Intergrated Transponder (PIT) Tag Interrogation Systems in Remote Locations

Many juvenile salmon are presently being captured and tagged using passive integrated transponder (PIT) tags and then released into small streams located in remote locations. NMFS has developed both in-stream pass-by, pass-through, and hybrid PIT-tag interrogation systems that operate using 120 V AC or 24 V DC power supplies. Using these systems a number of studies related to fisheries can now be addressed (i.e., what is the in-stream survival for a specific stream reach, what type of stream environment is best suited for a particular species or life stage, and when do fish start to migrate from that stream). However, for the in-stream PIT-tag interrogation systems to be practical for

the overall fisheries community, they must be designed with the following requirements in mind. They must operate as stand-alone systems for periods ranging from several days to months without service; be easily deployed; operate under a wide range of environmental conditions; and be dependable and effective in obtaining information on PIT-tagged fish.

Working towards the above objective, the in-stream PIT-tag interrogation system development project has been divided into several subsystems for convenience. At this time one of our greater challenges is obtaining a portable 24 V DC power supply that can deliver a minimum of 175 watts (requirement varies on equipment to be powered) on a 24/7 bases for several months. Presently a combination of batteries and solar power is used to approach this operation goal. This approach however is limiting because of the size of the solar array foot print, work locations, battery weight, maintenance, etc.. At this time we are interested in alternative power systems to either supplement the solar battery recharge system or replace the power system in part or totally. Fuel for a power generator system (generator not defined)should not be in a liquid form and must be readily available nation wide. Traditional internal combustion power generator will not be considered as an alternative power source for this project.

8.3.5F Subtopic: New Non-Towed Research Net to Sample Microneckton in the Deep Ocean Water Column

The inability to efficiently sample highly motile micronektonic (ca. 20-200 mm in length) animals in the pelagic environment continues to confound fishery biologists engaged in biological and ecological studies involving highly migratory species (e.g., tunas and billfishes). Whether the intent is to obtain juvenile forms of commercially important fishes and cephalopods for life history studies, or to gather information on deep forage species that reside in the sonic scattering layer (SSL) and constitute the forage base for the larger pelagic predators, the single biggest sampling limitation is that imposed by current available fishing technology. Uneven (patchy) distribution of animals in the environment and their ability to avoid fishing gear make these animals extremely difficult to capture efficiently. To overcome some of the sampling shortcomings, scientists and fishing engineers have constructed towed nets that are either very large, can be towed very fast, or of some combination of the two to reduce net avoidance. Still, the results have been unsatisfactory.

One of the current thoughts among scientists specializing in the study of micronekton to address the avoidance issue is to have a net engineered that is not towed; i.e., the new technology might be a form of lift net, drop net, or perhaps a type of small mesh seine that eliminates the biases associated with towed gears (e.g., visual and pressure detection, extrusion, etc.). With regards to some of the required specifications, the engineered net must functionally at least (1) get to and sample at a depths at least to 200 m; (2) be deployed off a single research vessel (i.e., no launch of smaller craft required), (3) fish efficiently with dramatically reduced mesh sizes (e.g., 0.505 mm Nitex); and (4) minimize anatomical damage to the animals being caught.

8.3.6R Subtopic: Automation of the Classification of Lidar Targets

The Environmental Techology Laboratory is developing an airborne lidar (light detection and ranging) system for fisheries research and management. A short pulse of light is transmitted from an aircraft into the ocean and the reflected light is detected. The strength of the return is related to the density of fish and other scatterers in the water, and the depth is inferred from the timing of the return. The problem to be addressed by this

subtopic is the automation of the classification of lidar targets. The most common classes of targets are 1) single large fish or marine mammals, 2) schools of small fish, 3) layers of plankton, and 4) the sea floor. This type of classification is fairly straightforward by visual inspection, but the volume of data produced in even a short flight makes that process very tedious. Several commercial software packages exist that perform this type of classification on echo sounder data, and a similar package for lidar would make this type of lidar a viable commercial product.

8.4 TOPIC: OCEAN SCIENCE

8.4.1SG Subtopic: Aquaculture: Developing and Improving Species Culture

Proposals are requested for research which offers to make significant, industry-wide improvements in finfish, shellfish, and ornamental fish culture systems for both small scale and large scale applications. Priority will be given to research which finds innovative approaches that will solve major industry bottlenecks in an economically and environmentally compatible manner. Research aimed at new species for culture and research to adapt techniques being used successfully in other countries are appropriate.

8.4.2SG Subtopic: Aquaculture: Water Reuse and Effluent Treatment Systems

Proposals are requested for developing integrated aquaculture systems with minimum impact on the environment. These include development of innovative water reuse systems for ponds and raceways and other novel systems for treating effluent. Special priority will be given to prototype, modular water reuse systems suitable for producing a variety of species anywhere in the United States.

8.4.3F Subtopic: Aquaculture: Recirculating Seawater Systems Technologies

Development of recirculating systems for the culture of marine organisms is on the increase in the U.S., as they are environmentally friendly systems. Systems are available for the culture of juveniles and adults, but much less is known about the culture of the early life stages, particularly bivalves, using such systems. Development of recirculating systems for early life stages would reduce space requirements for rearing large numbers of organisms, reduce labor costs for food production, and increase rearing capacity. Such systems would advance significantly the culture and promotion of commercially and recreationally important marine species for both private and public aquaculture and for potential stock enhancement uses.

8.4.4SG Subtopic: Aquaculture of Marine Organisms for Marine Natural Products

Research in the past two decades has found that there are many marine organisms which produce novel natural products of use in treating human diseases. To utilize these products commercially and in clinical trial, however, they need either to be chemically synthesized, produced using biotechnology, or produced through aquaculture of the organism. Research is needed to find economically cost-effective and biologically viable ways to culture marine organisms specifically for their production of novel natural products.

8.4.5SG Subtopic: Open-Ocean Aquaculture Systems

Both engineering and biological technology needs to be explored for the development of open-ocean or offshore culture systems. Large scale, offshore, submersible and floating systems need to be developed for Atlantic, Gulf of Mexico and Pacific conditions. Automation of feeding and harvesting functions as well as telemetry and remote control systems will be considered in this competition. The biological technology would include hatchery, nursery and transport systems for candidate species for open ocean-aquaculture. Field tests of candidate species are encouraged.

8.4.6SG Subtopic: Disease Diagnostics and Controls

Given the severe problems with aquaculture disease diagnostics and controls, we seek proposals in those areas in order to reduce the impacts on the US aquaculture industry.

8.4.7N Subtopic: Development of Multi-Hazard Contingency Plans and Tools for National Marine Sanctuaries

This subtopic calls for the development of a web-based contingency plan and set of tools for national marine sanctuary spill planning and management. NOAA requires such a system to bring together in one readily accessible resource, the knowledge and expertise necessary for NOAA to address two critical components of it's management mission: the stewardship of Sanctuary resources and the ability to provide effective and timely response information about NOAA trust resources. These new sanctuary specific spill planning and management tools are needed to meet rapidly changing resource protection priorities in light of national security issues, and resource protection needs within National Marine Sanctuary (NMS) sites.

The subtopic calls for an iterative web-based system providing one source for all relevant resource and maritime use information within the National Marine Sanctuary System as well a comprehensive database of underwater hazards within the US coastal zone. It should include GIS maps, environmental sensitivity indexes, resources at risk information, coastal observations systems such as PORTS, TABS and NDBC buoy systems, aerial photos, oceanography data, cultural resources, Minerals Management System information, biological baseline data, sonar data, digital charts, etc.

This project should result in the development of All/Multi-Hazard Contingency Plan/Tool for four NMS sites (FKNMS, SBNMS, GFNMS, FGBNMS), and also, an All/Multi-Hazard Contingency Plan/Tool that will serve NOAA and its partner management agencies to facilitate decision-making abilities within the coastal zone during non-response events. This includes the USCG Office of Response and the Navy SUPSALV.

This comprehensive contingency plan computer application has the potential to be used to protect coastal resources for state, local and private interests. The one-source system can be utilized by other government agencies, non-profit groups such as land trusts or the private entities to efficiently manage HAZMAT spill and/or natural disaster response and restoration in coastal areas.

8.4.8SG Subtopic: Development of Computer Simulation Models for Water Levels and Currrent Prediction Within Estuaries and Bays

As a result of increased understanding of three-dimensional free surface stratified flows, availability of powerful graphical software packages, and high speed PCs and workstations, the reliable prediction of water levels and currents over depth in estuaries and bays is now becoming feasible using computer simulation. This initiative seeks to provide greater understanding of estuarine dynamical processes through improved models of estuarine circulation. The ultimate objective is to develop improved three-dimensional free surface hydrodynamic models for inclusion in the nowcast/forecast component of NOS PORTS. The models must address: 1) wetting and drying and potential overland flooding, 2) current prediction over depth within intersecting navigation channels, 3) high horizontal salinity gradients with significant vertical stratification, and 4) heat flux prescription. The models must also include water surface elevation and flow boundaries and be able to represent point and non-point inflows. Additional topics which we seek to address include particle tracking schemes, wave-current interaction and sediment induced density modification effects. The display and interpretation of simulation results via animation or other advanced graphical techniques is encouraged.

8.5 TOPIC: CARTOGRAPHY, PHOTOGRAMMETRY, HYDOGRAPHY, AND GEODESY

8.5.1N Subtopic: Cartographic Data and Geographic Information Systems (GIS)

Innovations with commercial potential are sought incorporating new and emerging technologies related to digital cartographic and GIS systems to support National Ocean Service (NOS) requirements. The NOS makes its products, data, and metadata available to agencies, academia, and the public through electronic access via computer networks. Needed research critical to the NOS mission includes:

a) New methods for generation, update, and transfer of geo-data products and data files from spatial data bases, including raster images, to meet emerging requirements of Electronic Chart Display and Information System (ECDIS) and similar shipboard electronic navigation systems using raster displays.

b) User-transparent approaches to geo-data and geo-processing interoperability across networks (e.g., the Internet), for software interoperability: automatically invoked platform independent processing functions; and data interoperability: user-transparent autonomous standard file format conversions.

c) Innovations for easily locating, accessing, searching, transferring, reformatting, and portraying geo-data and GIS graphic products across networks. These could involve knowledge processing via expert systems and/or neural nets, hyper-links (e.g., Netscape-like), geospatial search engines, or improved conventional techniques.

d) New methods for enhancing/compressing raster images of nautical chart features, including text and feature symbology. These can range from conventional image processing and optical character recognition algorithms to the use of expert systems, fuzzy logic, neural nets, and specialized pattern recognition/matching algorithms.

e) Improved methods for error-free raster-to-vector and vector-to-raster conversion/compression for digital raster images, including semi-automated GIS data attribution and metadata generation directly from the vectorized raster data files.

f) Heads-up raster and vector navigation and nautical charting data shown in two and three dimensional displays for mariners. Such practical information could be shown on (semi-)transparent, portable, heads-up displays superimposed in novel ways on the actual environment to help mariners navigate, especially in conditions of limited visibility.

g) A comprehensive method for remote real-time monitoring of navigation channel depths to within 1 foot and widths to within 10 feet throughout the entire channel length (1 mile to 100 miles). The method must be comparable in cost to the periodic sonar surveys currently in use. A "survey" by this method should require 24 hours or less, if possible.

8.5.2N Subtopic: Electronic Charting of Marine Protected Areas

NOAA's National Ocean Service and National Marine Fisheries Service are responsible for the designation and enforcement of a variety of marine protected areas in the federal exclusive economic zone. These areas vary greatly in size and regulatory complexity, but are generally established to enhance conservation of living marine resources, habitat, or cultural and historic resources. Most of the areas like national marine sanctuaries and critical habitat areas, are identified on the electronic charts offered by private industry, however mariners are not provided with an alert when their vessel enters these protected waters and, therefore, may not be aware of the restrictions in place for activities in the protected zone.

This subtopic requests development of a feature in electronic charting systems that will provide real time notification to the mariner of vessel entry into marine protected areas of the United States. The feature could be comparable to that currently provided in aeronautical electronic charts that notifies pilots of entry into restricted airspace. The alert could be a brief notice that appears on screen then refers the mariner to a text document for specifics on the restrictions applicable to the area.

As marine protected areas become increasingly complex from a regulatory standpoint, the mariner needs accurate and timely information on the restrictions in force. In the 2800 sq nmi Florida Keys National Marine Sanctuary, there are over 50 subzones with differing regulatory requirements. As the mariner transits these zones, it is important to be aware of the restrictions in place.

8.5.3N Subtopic: Hydrographic Survey Technology

a) Sound Velocity: Recent advances in, and the widespread use of, shallow water multibeam systems have proven that historical correction techniques for sound speed are not sufficiently dense in spatial and temporal dimensions for the present and future technology. The acoustics have, in short, out-propagated the knowledge of the water column. Development of new methods of determining the acoustic path of sound produced by modern transducers in the frequency range of fifty to five hundred Hertz

(50-500 Hz) and depth ranges of five to five hundred meters is desired. The technology may be based on direct measurement using small, retrievable sensors, similar to the ARGO floats used in the Global Ocean Data Assimilation Experiment (GODAE) (http://www.bom.gov.au/bmrc/ocean/GODAE/), or through innovative approaches to determining the speed and direction of propagation of sound. The goal of this subtopic is to reach a true, non-interpolated, near-real time, array of corrections which would be equivalent to traditional sound speed vertical profiles conducted on a grid size of one kilometer or less. The product must also have inherent data management and visualization tools to allow application of the corrections to multibeam soundings and to provide the user with predictive tools for changes in the water column that may affect overall survey accuracy.

b) Near-Shore Depth Data Acquisition: Depth determination in near-coastal areas with turbid waters less then five meters deep is presently inefficient and expensive; acoustic methods do not achieve sufficient swath width, and laser bathymetry does not confidently determine accurate depths in the turbid environment. Achieving high-quality and resolution while maintaining full-bottom coverage over large areas is thus not possible; the trade-off between resolution and operational efficiency typically reduces quality of the data. NOAA recognizes that the coastal managers and the habitat research community require depth data throughout the nearshore zone, and that this data may not always meet nautical charting accuracies. NOAA also has identified interferometric bathymetry techniques as a possible solution, but current technology does not address inefficiencies due to data gaps caused by shadows from bathymetric features, thus reducing the effective swath to be similar to standard multibeam echosounders in non-regular bathymetry. Absolute positioning accuracy of less than three meters and fully-corrected depth resolution of less than one-half meter is desired, but solutions with depth measurement resolution of one-half meter will be considered, as well as non-acoustic methods that achieve large-scale coverage with similar resolution and accuracy. The solution should address operational data acquisition, processing, and verification of accuracy and resolution in various operating conditions, ranging from two-meter swells on open coasts (e.g. Maine) to sub-decimeter depths in inner bays (e.g., Tampa Bay).

9.0 SUBMISSION FORMS

9.1 NOAA/SBIR COVER PAGE

PROGRAM: NOAA/SBIR - SMALL BUSINESS INNOVATION RESEARCH	This firm and/or Principal Investigator ☐ has ☐ has not submitted proposals for essentially equivalent work under other federal program solicitations, or ☐ has ☐ has not received other federal awards for essentially equivalent work.
SOLICITATION NO.: DOC 2003-1	CLOSING DATE: January 15, 2003
NAME OF SUBMITTING FIRM	TAXPAYER ID NO.
ADDRESS OF FIRM (INCLUDING ZIP CODE + 4)	
TITLE OF PROPOSED PROJECT	
REQUESTED AMOUNT: $	PROPOSED DURATION: 6 MONTHS
SOLICITATION SUBTOPIC NO.	SOLICITATION SUBTOPIC TITLE

THE ABOVE ORGANIZATION CERTIFIES THAT: (Check appropriate box by hitting space bar)	YES	NO
1. It is a small business firm as defined on page 3.		
2. The primary employment of the principal investigator will be with the firm at the time of award and during the conduct of the research.		
3. A minimum of two-thirds of the research will be performed by this firm in Phase 1.		
4. It qualifies as a minority and disadvantaged small business as defined on page3.		
5. It qualifies as a woman-owned small business as defined on page 4.		
6. It will permit the government to disclose the title and technical abstract page, plus the name, address and telephone number of the corporate official if the proposal does not result in an award to parties that may be interested in contacting it for further information or possible investment.		

PRINCIPAL INVESTIGATOR/ PROJECT DIRECTOR	CORPORATE OFFICIAL (BUSINESS)	OTHER INFORMATION
NAME	NAME	YEAR FIRM FOUNDED
SIGNATURE DATE:	SIGNATURE DATE:	NUMBER OF EMPLOYEES Avg. Previous 12 mos. _____ Currently _____
TITLE	TITLE	HAS THIS PROPOSAL BEEN SUBMITTED TO ANOTHER AGENCY? Yes_____No_____
TELEPHONE NO. + AREA CODE	TELEPHONE NO. + AREA CODE	IF YES, WHAT AGENCY?
E-MAIL:	E-MAIL:	FAX #:

PROPRIETARY NOTICE

For any purpose other than to evaluate the proposal, this data shall not be disclosed outside of the Government and shall not be duplicated, used or disclosed in whole or in part, provided that if a funding agreement is awarded to this proposer as a result of or in connection with this submission of this data, the Government shall have the right to duplicate, use, or disclose the data to the extent provided in the funding agreement. This restriction does not limit the Government's right to use information contained in the data source without restriction. The data in this proposal subject to this restriction is contained on separate proprietary page(s).

9.2 NOAA/SBIR PROJECT SUMMARY FORM

NAME OF FIRM	AMOUNT REQUESTED
ADDRESS	PHONE # FAX # E-MAIL:
PRINCIPAL INVESTIGATOR (NAME AND TITLE)	
TITLE OF PROJECT	
SOLICITATION SUBTOPIC NUMBER	SOLICITATION SUBTOPIC TITLE
TECHNICAL ABSTRACT (LIMIT 150 WORDS)	
SUMMARY OF ANTICIPATED RESULTS	
POTENTIAL COMMERCIAL APPLICATIONS	

9.3 NOAA/SBIR PROPOSAL SUMMARY BUDGET

FIRM:	PROPOSAL NUMBER: (Leave Blank)
PRINCIPAL INVESTIGATOR:	
	PRICE
DIRECT LABOR:	$
OVERHEAD RATE:	$
OTHER DIRECT COSTS:	$
MATERIALS:	$
GENERAL AND ADMINISTRATIVE (G&A):	$
PROFIT:	$
TOTAL PRICE PROPOSED:	$ 0.00
TYPED NAME AND TITLE:	SIGNATURE:_____
THIS PROPOSAL IS SUBMITTED IN RESPONSE TO NOAA SBIR PROGRAM SOLICITATION 2003-1 AND REFLECTS OUR BEST ESTIMATES AS OF THIS DATE. **DATE SUBMITTED:_____**	

9.4 NOAA/SBIR BUDGET INSTRUCTIONS

The offeror is to submit a cost estimate with detailed information for each element, consistent with the offeror's cost accounting system. This does not eliminate the need to fully document and justify the amounts requested in each category. Such documentation should be contained, as appropriate, on a budget explanation page immediately preceding the budget in the proposal.

1. Principal Investigator (PI).

The PI must be with the small business concern at the time of contract award and during the period of performance of the research effort. Additionally, more than half of the PI's time must be spent with the small business firm during the contract performance.

2. Direct Labor.

All personnel (including PI) must be listed individually, with the projected number of hours and hourly wage.

3. Overhead Rate.

Specify current rate and base. Use current rate already negotiated with a Federal agency, if available. If no rate has been negotiated, a reasonable overhead rate (10-15% is average) may be requested, which will be subject to approval by NOAA.

4. Other Direct Costs.

List all other direct costs which are not described above (i.e. consultants, subcontractor, travel, and equipment purchases). Each of the above needs a detailed explanation and elaboration of its relation to the project. (Up to $4,000 may be allocated for technical and commercial assistance.)

5. Materials.

The materials and supplies required for the project must be identified. There is also a need to specify type, quantity, unit cost, and total estimated cost of these materials and supplies.

6. General & Administration (G&A).

Specify current rate and base. Use current rate already negotiated with a Federal agency, if available. If no rate has been negotiated, a reasonable G&A rate may be requested, subject to approval by NOAA.

7. Profit.

The small business may request a reasonable profit (about 7 percent of costs is the average proposed).

10.0 NOAA/SBIR CHECKLIST

Please review this checklist carefully to assure that your proposal meets the NOAA requirements. Failure to meet these requirements may result in your proposal being returned without consideration. **Six copies of the proposal must be received by Noon EST January 15, 2003.**

_____ 1. The proposal is **25 PAGES OR LESS** in length.

_____ 2. The proposal is limited to only **ONE** of the subtopics in Section 8.

_____ 3. The proposal budget is for **$75,000 or LESS** (or $50,000 or less for those subtopics designated as "SG"). No more than one-third of the budget goes to consultants and/or subcontractors.

_____ 4. The abstract contains **no proprietary information** and does **not exceed** space provided on the Project Summary.

_____ 5. The proposal contains only pages of 21.6cm X 27.9cm size (8 ½" X 11").

_____ 6. The proposal contains **an easy-to-read font (fixed pitch of 12 or fewer characters per inch or proportional font of point size 10 or larger) with no more than 6 lines per inch,** except as a legend on reduced drawings, but not tables.

_____ 7. The **COVER PAGE** has been completed and is **PAGE 1** of the proposal.

_____ 8. The **PROJECT SUMMARY** has been completed and is **PAGE 2** of the proposal.

_____ 9. The **TECHNICAL CONTENT** of the proposal begins on **PAGE 3** and includes the items identified in **SECTION 3.3.3** of the solicitation.

_____ 10. The **SBIR PROPOSAL SUMMARY BUDGET** has been completed and is the **LAST PAGE** of the proposal.

_____ 11. The P.I. is employed by the company.

NOTE: Proposers are cautioned to be careful of unforeseen delays that can cause late arrival of proposals, with the result that they may be returned without evaluation.

11.0 SBIR NATIONAL CONFERENCES

FEDERAL R&D OPPORTUNITIES
FOR
TECHNOLOGY INTENSIVE FIRMS

Sponsored by:
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National Critical Technologies

Agency and company exhibits and/or One-on-One tables will be open for networking opportunities for all attendees!

BURLINGTON, VT	OCTOBER 28-31, 2002
ALBUQUERQUE, NM	MARCH 10-13, 2003
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For further information:

SBIR Homepage: www.sbirworld.com